

WHAT IS CLAIMED IS:

1 1. A method for expanding the capacity of a fixed digital field,
2 comprising:
3 providing a unique number field for a unique number calculated from
4 the bits in said digital field;
5 calculating a first unique number from said digital field according to a
6 first algorithm;
7 determining if said first unique number is present in said unique number
8 field;
9 assigning a first meaning to a particular combination of bits in said
10 digital field if said first unique number is present;
11 if said first unique number is not present, calculating a second unique
12 number according to a second algorithm;
13 determining if said second unique number is present in said unique
14 number field; and
15 assigning a second meaning to said particular combination of bits in said
16 digital field if said second unique number is present.

1 2. The method of claim 1 further comprising:
2 indicating an error if neither said first nor said second unique number is
3 present.

1 3. The method of claim 1 wherein said particular combination of bits
2 is a command.

1 4. The method of claim 3 wherein said command is for an operation in
2 a model train.

1 5. The method of claim 4 wherein said command further includes an
2 address of said model train.

1 6. The method of claim 1 wherein said first unique number is a
2 multiple bit code.

- 1 7. The method of claim 6 wherein said second unique number is the
2 inverse of said first unique number.
- 1 8. The method of claim 1 wherein said unique number is an error code.
- 1 9. The method of claim 1 wherein said fixed digital field is part of a
2 transmission packet.
- 1 10. The method of claim 1 wherein fill bits are used in transmission of
2 said fixed digital field, and further comprising:
3 detecting said fill bits;
4 determining if said fill bits have a value other than a designated fill value;
5 if said fill bits have a value other than said designated fill value, assigning a
6 different meaning to the combination of bits in said fixed digital field based on the value
7 of said fill bits.
- 1 11. The method of claim 10 further comprising:
2 modifying a value of one of said fill bits, in accordance with the values of
3 remaining ones of said fill bits, to minimize a DC offset of said transmission packet and
4 fill bits.
- 1 12. The method of claim 10 further comprising:
2 utilizing at least one of said fill bits in calculating said second unique
3 number.
- 1 13. The method of claim 10 wherein said first unique number is a
2 multiple bit code and said second unique number is the inverse of said first unique
3 number.
- 1 14. A method for expanding the capacity of a fixed digital command
2 field for a model train control system, comprising:
3 providing a multiple bit error code field for a unique number calculated
4 from the command bits in said digital field;
5 calculating a first multiple bit error code from said digital field according to
6 a first algorithm;

7 determining if said first multiple bit error code is present in said unique
8 number field;
9 assigning a first meaning to a particular combination of bits in said digital
10 field if said first multiple bit error code is present;
11 if said first multiple bit error code is not present, calculating a second
12 multiple bit error code according to a second algorithm;
13 determining if said second multiple bit error code is present in said multiple
14 bit error code field;
15 assigning a second meaning to said particular combination of bits in said
16 digital field if said second multiple bit error code is present; and
17 indicating an error if neither said first nor said second multiple bit error
18 code is present.

1 15. A method for expanding the capacity of a fixed digital command
2 field for a model train control system, wherein the command field comprises four nibbles
3 of four bits each, comprising:
4 providing a multiple bit checksum field for a unique number calculated
5 from the command bits in said digital field;
6 calculating a first checksum from said command field by summing the
7 values of each of said nibbles and dropping the most significant bit of the result;
8 determining if said first checksum is present in said unique number field;
9 assigning a first meaning to a particular combination of bits in said
10 command field if said first checksum is present;
11 if said first checksum is not present, calculating a second multiple bit error
12 code according to a second algorithm;
13 determining if said second multiple bit error code is present in said multiple
14 bit error code field; and
15 assigning a second meaning to said particular combination of bits in said
16 command field if said second multiple bit error code is present; and
17 indicating an error if neither said first nor said second multiple bit error
18 code is present.

1 16. An apparatus for receiving a digital field, comprising:
2 a memory storing first and second algorithms;

3 a processor, coupled to said memory;
4 a program embodied in computer readable code in said memory, containing
5 instructions configured to
6 detect a unique number field for a unique number calculated from the bits
7 in said digital field;
8 calculate a first unique number from said digital field according to said first
9 algorithm;
10 determine if said first unique number is present in said unique number
11 field;
12 assign a first meaning to a particular combination of bits in said digital field
13 if said first unique number is present;
14 if said first unique number is not present, calculate a second unique number
15 according to a second algorithm;
16 determine if said second unique number is present in said unique number
17 field; and
18 assign a second meaning to said particular combination of bits in said
19 digital field if said second unique number is present.

1 17. The apparatus of claim 15 wherein said processor is a hardware
2 FPGA.

1 18. A method for expanding the capacity of a fixed digital field in a
2 transmission packet, wherein fill bits are used in transmission, comprising:
3 detecting said fill bits;
4 determining if said fill bits have a value other than a designated fill value;
5 if said fill bits have a value other than said designated fill value, assigning a
6 different meaning to the combination of bits in said fixed digital field based on the value
7 of said fill bits.

1 19. The method of claim 16 further comprising:
2 modifying a value of one of said fill bits, in accordance with the values of
3 remaining ones of said fill bits, to minimize a DC offset of said transmission packet and
4 fill bits.

1 20. The method of claim 16 wherein a recipient of said transmission
2 packet calculates an expected value of said one of said fill bits, a phase bit, and compares a
3 received value of said phase bit to said expected value.

1 21. The method of claim 16 wherein said packet includes an error code,
2 and further comprising:
3 utilizing at least one of said fill bits in calculating said error code.

1 22. An apparatus for receiving a digital field in a transmission packet
2 wherein fill bits are used in transmission, comprising:
3 a memory storing first and second algorithms;
4 a processor, coupled to said memory,
5 a program embodied in computer readable code in said memory, containing
6 instructions configured to
7 detect said fill bits;
8 determine if said fill bits have a value other than a designated fill value;
9 if said fill bits have a value other than said designated fill value, assign a
10 different meaning to the combination of bits in said fixed digital field based on the value
11 of said fill bits.